



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Art Unit : 1742  
Examiner : Andrew E. Wessman  
Serial No. : 09/680,088  
Filed : October 5, 2000  
Inventors : Seiji Nabeshima  
          : Yasuo Kishimoto  
          : Shuji Takeuchi  
Title : RUST-RESISTANT  
      : CALCIUM STEEL



038511

PATENT & TRADEMARK OFFICE

Docket No.: 1396-00  
Confirmation No.: 8261

Dated: February 20, 2003

Commissioner for Patents  
Washington, DC 20231

Sir:

AMENDMENT

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Applicants respectfully submit that this reply fully responds to the outstanding Office Action

mailed on November 20, 2002.

Marked up Version in the Claims

3. (Twice Amended) A Ca-containing rust-resistant steel ~~according to Claim 1~~ comprising  
Ca at a concentration of 0.0005 wt% or more, wherein the composition of oxide inclusions and sulfur  
concentration in said steel are controled so that the equilibrium sulfur soluble amount (%S inc.)  
value of at least 80% of CaO-containing oxide inclusions having a particle diameter of 2  $\mu$ m or  
larger is about 0.03 wt% or less, wherein said equilibrium sulfur soluble amount (%S inc.) value is  
determined in accordance with the following equation (1), including as its parameters the optical  
basicity calculated from the composition of said oxide inclusions, the casting temperature and the  
components forming the steel, such equation being

$$\log (\%S \text{ inc.}) = (21920 - 54640\Lambda)/T + 43.6\Lambda - 23.9 - \log [aO] + \log [\text{wt}\%S], \dots(1)$$

wherein

C

T represents the casting temperature (K) during the continuous casting process,  
[wt%S] represents the concentration of S contained in said steel,  
[aO] represents the oxygen activity of said molten steel at said casting temperature (T) during  
a continuous casting process, and

wherein during Al-deoxidation,

$$\log aO = (-64000/T + 20.57 - 2\log[\text{wt\%Al}] - 0.086 [\text{wt\% Al}] - 0.102 [\text{wt\% Si}]) / 3, \text{ and}$$

wherein during Ti-deoxidation,

$$\log aO = (-60709/T + 20.97 - 2\log[\text{wt\%Ti}] - 0.084 [\text{wt\%Ti}]) / 3,$$

and provided that, when Al and Ti are present in said steel, a smaller aO oxygen activity is  
provided,

wherein  $\Lambda$  represents the optical basicity of oxide inclusions according to equation (2)

$$\Lambda = 1.0 X (\text{CaO}) + 0.605 X (\text{Al}_2\text{O}_3) + 0.601 X (\text{TiO}_2) + 0.78 X (\text{MgO}) + 0.48 X (\text{SiO}_2) + 0.55 X (\text{Cr}_2\text{O}_3) + 0.59 X (\text{MnO})$$

and wherein

X (MmOn) represents the cation equivalent of the oxide present, according to the following  
equation (3):

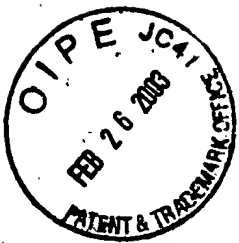
$$X (\text{MmOn}) = n \times N (\text{MmOn}) / \Sigma (n \times N (\text{MmOn})), \quad \dots(3)$$

wherein

N (MmOn) represents the mol fraction of oxide present and

n represents the valence of oxygen contained in said oxide.





Attorney Docket No.: 1396-00

In re Application of Seiji Nabeshima et al.

Serial No.: 09/680,088

Filed: October 5, 2000

For: RUST-RESISTANT CALCIUM STEEL

COMMISSIONER FOR PATENTS  
Washington, DC 20231

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Sir:

Transmitted herewith is an Amendment in the above-identified application.

— Small entity status of this application under 37 CFR §1.9 and §1.27 has been established by a verified statement previously submitted.

— A verified statement to establish small entity status under 37 CFR §1.9 and §1.27 is enclosed.

x No additional fee is required.

The fee has been calculated as shown below:

(Col. 1)

(Col. 2) (Col. 3)

SMALL ENTITY

OTHER THAN  
SMALL ENTITY

	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NO. PRE- VIOUSLY PAID FOR	PRESENT EXTRA
TOTAL	3	-	** 20 =	0
INDEP.	3	-	*** 3 =	0
___ First presentation of multiple dependent claim				

RATE	ADD'L FEE
x 9=	\$
x42=	\$
+140=	\$

OR

RATE	ADD'L FEE
x18=	\$
x84=	\$
+280=	\$

TOTAL ADDITIONAL FEE \$0 OR \$\_\_\_\_\_

- \* If the entry in Col. 1 is less than the entry in Col. 2, write "0" in Col. 3.
- \*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, write "20" in this space.
- \*\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, write "3" in this space.

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found from the equivalent box in Col. 1 of a prior amendment or the number of claims originally filed.


— Please charge my Deposit Account No. 50-1442 in the amount of \$\_\_\_\_\_.  
A duplicate copy of this sheet is enclosed.

— A check in the amount of \$\_\_\_\_\_ is attached.

x The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 13-3405. A duplicate copy of this sheet is enclosed.

x Any filing fees under 37 CFR §1.16 for the presentation of extra claims.

x Any patent application processing fees under 37 CFR §1.17 with the exception of the Issue Fee which we intend to pay by check.

  
\_\_\_\_\_  
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